# Light and Lighting

Official Journal of the Illuminating Engineering Society.

Incorporating "The Illuminating Engineer."

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## Going into Committee...

IT has been said that the best Committee is a Committee of *One*. If you want quick results—yes. If you want acceptable results —probably no.

What then should determine the size of a Committee? Partly the percentage of members who can be relied upon to attend, but mainly the subject under consideration. When matters of policy are discussed there is strength in numbers. Confidence is gained by unanimity of a representative jury.

If the terms of reference are mainly technical a few earnest workers should suffice. Further specialised knowledge can be sought between meetings if need be.

At Committee Meetings decisions should be taken, but reports embodying them should be composed between meetings by those gifted with a ready pen. The results should then be examined and amended in Committee and a final polish given behind the scenes.

In these days waste of time is criminal. How hard, therefore, is the task of the Chairman who must check prolixity, discourage oratory, and bring all things to a point—and yet without apparent exercise of the "high hand."

"Business, gentlemen, business!" and yet—to quote from a recent circular issued in the U.S.A. —whoever heard of I.E.S. members getting together without some fun?

## *The Physical Society "Optical Group"*

Readers will have noticed in these pages references to the activities of the Colour Group formed under the ægis of the Physical Society, which has already held quite a number of interesting meetings.

A similar step has now been taken in connection with Optics by the formation of "The Physical Society Optical Group." Its objects are thus defined:—

Its objects include the provision of opportunities for physicists, designers, and users of optical instruments and others interested to meet and discuss achievements and difficulties, the encouragement of research and education and the fostering of public interest in optical science.

The constitution is on similar lines to that of the Colour Group. Meetings will be arranged and papers read. All members of the Physical Society are eligible to be members of the Group. The subscription for others is half-a-guinea per annum, but members of the affiliated societies named, of which the Illuminating Engineering Society is one, may join by paying an annual subscription of 5s. per annum.

We have no doubt that in this case, as in the case of the Colour Group, there will be I.E.S. members who wish to join, which they can do by making application to the Honorary Secretary (Mr. L. C. Martin, 1, Lowther-gardens, Exhibition-road, London, S.W.7.

## *Road Accident Statistics*

The experience of the last great war, that the initial alarming increase in road accidents tends to diminish eventually, is being repeated.

Recent figures of road accidents issued by the Ministry of Transport reveal an encouraging diminution as compared with last year. In April and May smaller numbers of fatalities for all classes of road users are recorded in "Safety News." For the complete nine months, September to May, the number of fatalities to adult pedestrians in the black-out was 1,788, as compared with 2,516, and in the day-time 845, as compared with 1,036. If we go back to 1939-40 the respective figures were 2,980 and 650, but there are many factors which make this comparison difficult to interpret, such as the abnormal conditions prevailing when the black-out was first introduced and the effect of subsequent changes in connection with summer time. During the past nine months the number of accidents during the black-out was thus still more than twice that in daylight—surely a remarkable circumstance considering that pedestrians use the streets so little at night. The comparison between winter and summer months is instructive in showing how great is the influence of darkness. In January 418 adult pedestrians were killed in the black-out and only 100 in daylight, a ratio of more than 4 to 1. In May, however, the fatalities in darkness were only 24, as compared with 85 in daylight, a ratio of 3½ to 1 in the opposite direction!

## *Street Lighting During Black-outs in U.S.A.*

It is stated in "Illuminating Engineering" (June, 1942, p. 339) that the United States War Department has issued a specification defining street lighting during black-outs. It is noteworthy that this specification was prepared, not by some administrative official, but by the Engineer Board, under the direction of the Chief of Engineers, U.S. Army.

Except when and where black-outs are ordered by the proper military authority, normal street lighting will prevail and curtailment is not advised, "as this . . . results in added traffic hazards without any significant decrease in ease of detection and identification from the air." The actual standard of illumination permitted for black-out street lighting is 0.0003 foot-candle average, with a maximum not exceeding 0.0006. This is regarded as about twice that provided by starlight on a clear, moonless night. (It is somewhat higher than the standard adopted in this country.) White light is advised. Blue light is declared unsuitable, as being "most easily detected from the air by dark-adapted aerial observers, while providing hazy and indistinct ground visibility useful only after long periods of eye-adaptation."

It is pointed out that although this emergency street lighting may be of great value as an aid to movement during air raids, it provides such low visibility that anything approaching normal movement is impossible.

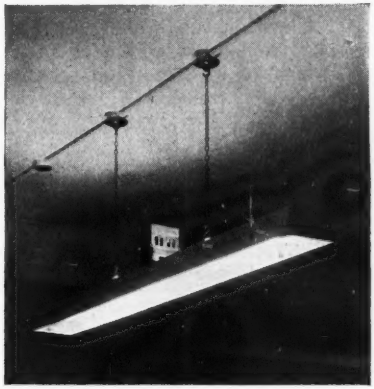
Methods of control of black-out street lighting and the construction, spacing, photometric tests and marking of fittings are set out in the specification, and polar curves of light distribution are given.

Standards of illumination for docks, platforms, open sheds, parks, etc., have also been framed. Black-out standards for traffic signs and signals, vehicles, flashlights, advertising signs, show-windows, etc., are under consideration.

## *Fluorescent Lighting*

### *Avoidance of the "Tunnel Effect"*

In view of the fact that lighting with the new fluorescent lamps has so often been hailed as a complete remedy for the depressing "tunnel effect," characteristic of much conventional industrial lighting, it is interesting to note the recognition that this effect *may* occur even with fluorescent tubes — more particularly when they are enclosed in opaque trough reflectors and mounted at a relatively low level. The tunnel effect is partly a matter of background. When walls and ceiling are light in colour, and when tubes are mounted fairly high up, it is less likely to arise. Low mounting, however, cannot always be avoided, and a new form of reflector introduced by the General Electric Company, Ltd., seems to provide a remedy in such circumstances by reverting to the "open top" principle, permitting light to be emitted in an upward direction. Other incidental advantages of the reflector, here illustrated, are that the amount of steel used and the cost are both diminished.



**A view of the new fitting for fluorescent lamps showing how the upper background is illuminated through the open top of the reflector.**

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## Fluorescent Lighting in a Mule Spinning Shed

One of the most extensive installations of 80-watt fluorescent discharge tubes in a mule spinning shed has just been completed at the mill of Messrs. J. B. Battye and Co., Ltd., Yeadon. In mule spinning the working plane is some 3 ft. 6 in. from floor level, and the whole of the frame area must be so lighted that the spinner can have all the threads under observation. The seeing task, whilst not particularly severe, is fatiguing if lighting conditions impede ready observation.

Before the Edison Swan Electric Company was asked to replan the lighting, the spinning shed was lighted by incandescent and mercury vapour lamps mounted at varying heights and spacings. The illumination was of a low order, uneven and produced undesirable shadows. The accompanying photograph illustrates part of the shed now lighted by Royal "Ediswan" fluorescent tubes in industrial trough reflectors mounted at 8 ft. 6 in. from floor level and spaced at 9 ft. centres. The intensity of illumination of 11 ft.c. enables the operatives to see individual threads from practically any part of the mule "gate" without eye strain or fatigue. Ediswan "Industra" adjustable trough reflectors have been installed throughout by the contractors, Messrs. J. W. Hinchcliffe, of Leeds.

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# "Waste of Electricity for Lighting"

Readers are doubtless aware that under an existing order, the waste of fuel for lighting is a misdemeanour. On August 12 the first cases of this kind were heard at Bow-street, when charges against the Dorchester Hotel, the Prince of Wales Theatre, and the Strand Hotel were considered.

In the case of the Dorchester Hotel it was stated that seventy-five lamps were left alight in the ballroom, which was empty, but was being used by waiters passing between the kitchen and the restaurant. All but twenty-five lamps were switched off, and these were found to give sufficient illumination. For the hotel it was stated that substantial reductions in consumption had already been made, but a fine of £15 15s., with £10 10s. costs was imposed. The same penalty was imposed on the Prince of Wales Theatre. The summons against the Strand Hotel, on whose behalf Mr. R. O. Ackerley gave expert evidence, was dismissed. According to the "Evening News" the magistrate said that the evidence for the prosecution fell short. "Their only witnesses had no special knowledge of electric lighting or illumination, and no special experience of it"—a welcome recognition that knowledge is of consequence in connection with lighting matters.

It would be interesting to know exactly how it was decided that the use of twenty-five lamps would have been permissible at the Dorchester Hotel. No doubt regulations defining more exactly what constitutes excessive lighting will be issued in due course.

## Fluorescent Lights and Fading

According to *Illuminating Engineering* recent tests have shown that there is no material advantage, as regards effect on fading and colours, to be gained by using special filters with fluorescent daylight lamps to absorb ultra-violet radiation. Experiments by Dr. M. Luckiesh and Dr. A. H. Taylor lead to the conclusion that one hours' exposure to full midsummer daylight, approx. 10,000 ft.c., will cause as much fading as one week of continuous exposure to an illumination of 100 ft.c. derived from fluorescent daylight lamps.

# Lighting for Production

Mr. Lay's recent paper on the above subject, which was summarised in our last issue (July, 1942, pp. 88 and 90) led to a very lively discussion and a number of useful points were raised.

### Fluorescent Lighting

Several speakers, including Mr. F. C. Wingfield, who opened the discussion, alluded to the deterrent influence of high initial cost. The view was expressed that the present high cost of fluorescent lamps is a great drawback. The policy of loading new and advanced products with heavy charges at the critical period of launching, it was suggested, may be mistaken. A different viewpoint is often taken by manufacturers abroad with more beneficial effect on progress.

The disappointment caused by the high initial drop of c.p. of fluorescent lamps was also mentioned. This is not got over by explaining that the extra c.p. at the start is, in a sense, a "gift" being above the rated value. The "better" the lamp in this respect the greater the fall. One speaker even suggested that manufacturers should age their lamps before sending them out so as to eliminate this initial drop! Allusion was also made to the use of reflectors with an open top, allowing light to pass upwards, which helps to avoid the "tunnel effect"—but it is perhaps wisest not to use this form of unit in dusty situations. (Incidentally, it was remarked that the effect of dust is found to be troublesome with most forms of open reflectors.)

### Maintenance and Depreciation

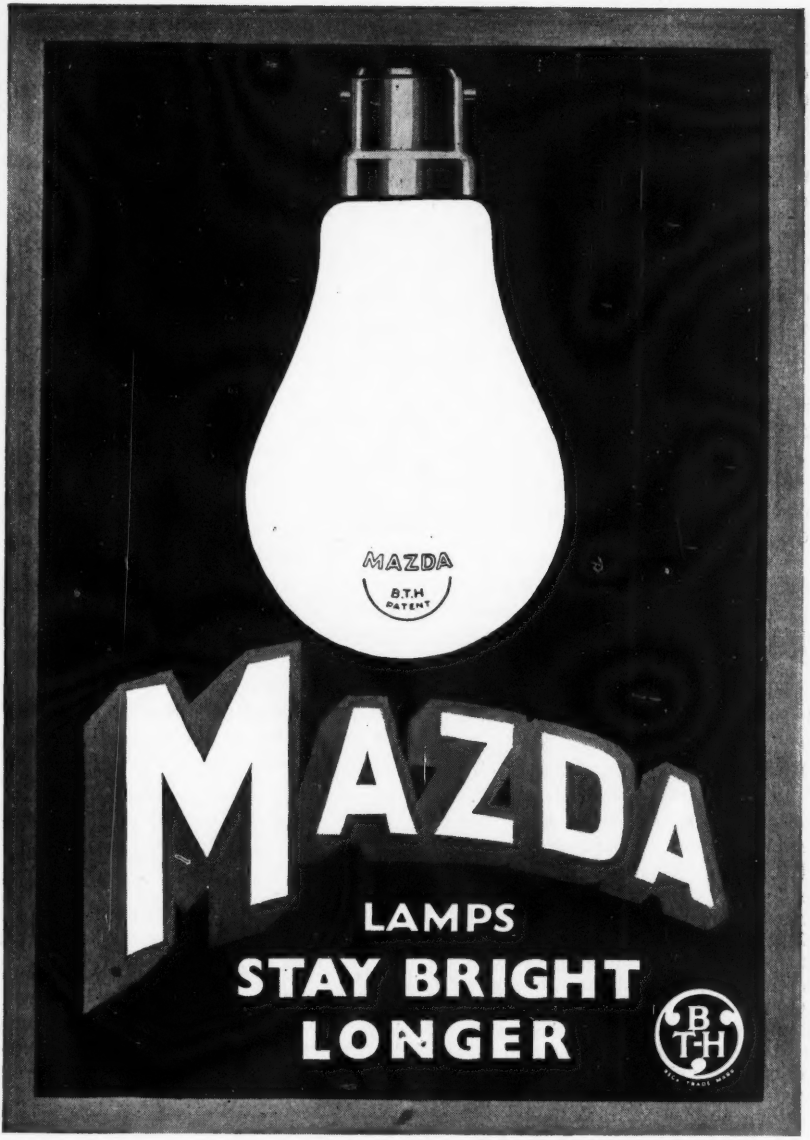
Various speakers discussed maintenance and depreciation. Mr. Tabraham mentioned an instance in which the replacement of unduly old lamps by new ones alone raised the illumination from one to three foot-candles, and the cleaning of reflectors brought a further increase to five foot-candles! Another speaker remarked that illuminating engineers advised on lamps and fittings—but how often did they advise the substitution of light colours for walls and ceilings—often a crucial point? It was remarked that really effective cleaning and maintenance of lamps and fittings was often beyond the resources of the staffs of factories—could not maintenance be dealt with on a tender basis? The effect of atmospheric absorption raised some comment. Mr. Lay, in his reply, agreed that 5 to 10 per cent. was perhaps the more usual figure, but in exceptionally bad atmospheric conditions 20 per cent. or over was not unknown.

Other points discussed were the specification of lighting conditions in terms of brightness as compared with foot-candles, the comparative costs of wiring fluorescent and tungsten filament lamp installations, and the expediency of securing a real imitation of daylight by adding to fluorescent lighting installations a judicious proportion of ultra-violet radiation.

### Tests of Better Lighting

Perhaps one of the most interesting contributions was that of Mr. Cox, who remarked that illuminating engineers had no means of determining whether a particular lighting installation was an improvement or not, other than by cross-examining the operators. He recalled a device used in psychological tests—the fixing of a bright light to an operator's hand which was photographed on a moving plate. If the track of the light followed a smooth curve this was evidence that operations were proceeding satisfactorily, where as a zigzag, irregular, or interrupted line might indicate trouble. Some such idea might perhaps be applied in judging lighting installations.

Mr. Cox also contended that it was unreasonable to expect professional knowledge outside the profession. The profession of the lighting engineer might be compared with the state of medicine

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fifty years ago. In fifty years' time it would be as natural to call in the lighting engineer as to consult the local doctor. The Society should aim at bringing illumination interests to the same status as that enjoyed by the medical profession to-day. He did not think that the man in the street would ever be in a position to diagnose his own illness, nor to advise on his own lighting problems.

## The Poetry of Light

On June 30 Mr. R. Gillespie Williams gave an address on the above subject at an I.E.S. meeting in Leicester. The address was on somewhat similar lines to that given in Nottingham in January last and enlarged upon the use of light not only as a means of dispelling darkness but as an end in itself. In the post-war era, it was predicted, light will be used not only to reveal beauty but to impart beauty.

Mr. Gillespie Williams was particularly concerned with colour effects which hitherto have been mainly static in character. In future, however, greater use will be made of variations in lighting and animated colour-effects. These ideas lend themselves at once to display and advertising, but the author visualised other radical changes.

Frontages of shops and stores would be designed for night architecture, so that individual and striking colour effects might be obtained during the hours of darkness. Display lighting in windows in combination with the background, would be elaborated, and colour lighting would be embodied in the decoration of the interior. Lighting—e.g., in public rooms and places of entertainment—would be adjusted according to the weather and seasons, swimming pools and fountains would be enhanced by the use of coloured light. Night architecture might come to predominate over day architecture and buildings constructed with fibrous plaster or stucco frontages, replaced every few years, and permitting elaborate designs. Decoration and dramatic colour lighting would be used to a far greater extent in cinemas and theatres, and even in the home colour schemes would play a more important part.

## A Brains Trust in Bath

Secretaries of I.E.S. Centres and Groups on the look out for entertaining evenings might do worse than consider the enterprising method recently adopted in Bath where Messrs. B. G. Horstmann, F. W. Shilstone, J. B. Harris, and T. Catten agreed to serve as a "Brains Trust," Mr. A. Faulkener acting as "Question Master."

The questions put certainly showed variety, one or two perhaps being hardly "fair," in the sense that they dealt with electrical rather than illuminating engineering, but the final query, "The possibility of the post-war use of barrage balloons for suspending high power lighting units in order to obtain street lighting without glare" is certainly an interesting one—which might perhaps be commended to the attention of the Lighting Reconstruction Committee.

## Obituary

DR. CLAYTON H. SHARP

MR. L. A. S. WOOD

We noted with regret the passing away of two past presidents of the Illuminating Engineering Society (U.S.A.) recorded in *Illuminating Engineering*. The name of Dr. Clayton Sharp is associated with much pioneering work, notably in photometry, and he took a leading part in international conferences. Mr. L. A. S. Wood was also well known in this country, more especially for his contributions in the field of street lighting.

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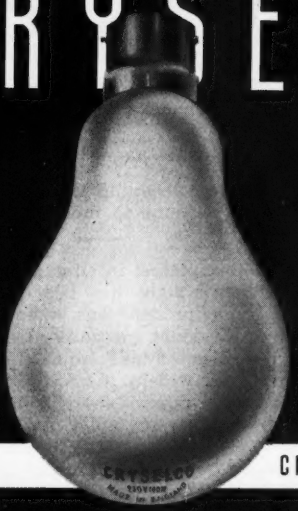


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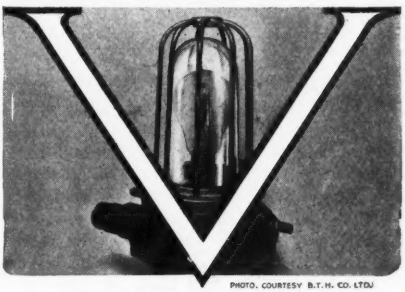

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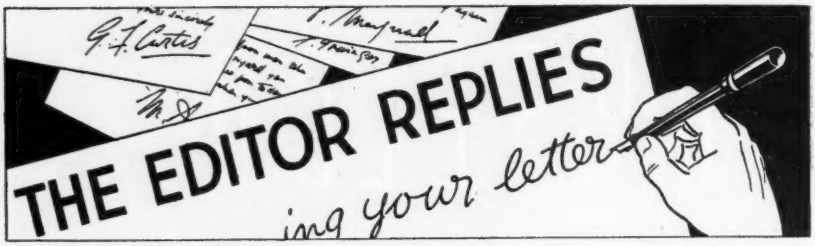



My attention has been drawn to a recent statement in the daily Press to the effect that the **lighting on the underground railway system** is to be still further curtailed—but not to a point where the safety or comfort of passengers would be prejudiced. I confess I learn with some apprehension that the present obscurity is to be accentuated. It is perhaps a matter of opinion whether safety has yet been imperilled. But most users who have tried to read their newspapers in trains and on station platforms, or have groped their way downwards after entering from the sunlight outside, would probably consider that their comfort, at least, has already suffered.

The **reversal by day of the black-out peril** by night has already been the subject of comment in these columns (June, 1942, p. 82). I have since heard frequent complaints of the dense obscurity into which one plunges—especially where anti-blast light locks have been constructed and no daylight penetrates to the stairway. Paradoxically it is chiefly **during the day** that an increase in interior lighting is desirable. One can manage better at night when one descends into weak illumination from almost complete darkness.

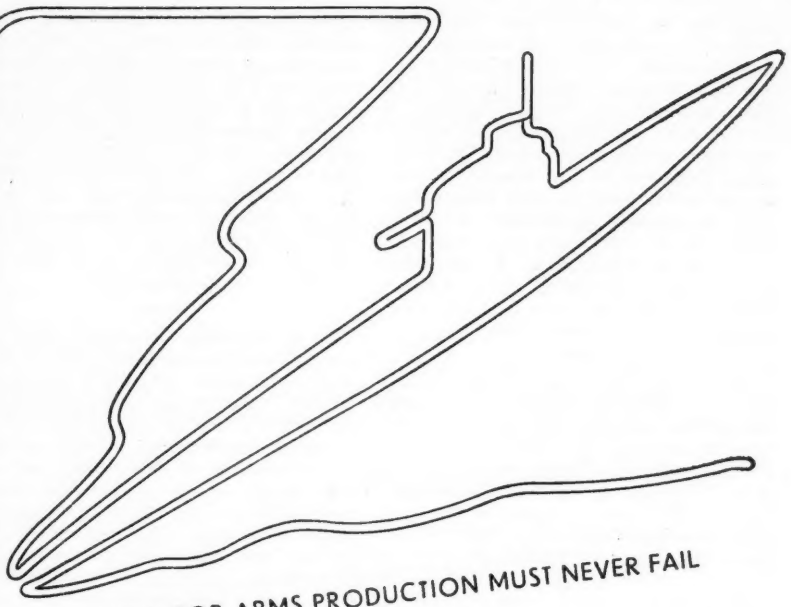
In some cases the effect of the entrance obstructions has evidently been overlooked. In others efforts to economise in consumption of electricity are responsible—it is odd to find serviceable lamps extinguished whilst deeply obscured ones, giving only a glimmer of light but consuming just as much electricity, continue to function.

Public interest in efforts to **economise in electric light** has been accentuated by recent prosecutions of hotels (see p. 99). No doubt the authorities have felt it necessary to take some action quickly, but it is evident that what constitutes "waste" requires more definition. We hope that clearer indications of the permissible amount of light will be forthcoming before long. In this, as in other cases, trouble might have been avoided by forethought, by exploring the position and taking expert advice before the actual crisis arrived.

On this matter the public needs guidance. As has been found in connection with other regulations there is a danger that, in concentrating effort on the restriction of light below a specified maximum, **the risk involved in failure to provide any minimum of necessary illumination** may be ignored.

The quotation by Mr. E. W. Murray (July, 1942, p. 91) implying a possible fatiguing effect of **fluorescent lighting** has brought me some comments. Most people seem surprised that anyone could consider this form of light as anything but restful. Yet I have myself recently met an engineer who declared that he found continuous work under the lamp trying to the eyes—though he agreed that the effect was excellent when mixed with daylight.

Mr. A. H. Owen writes of a somewhat similar case—a friend who had passed



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some time in a hospital which had been bricked up following raid damage, and was furnished with an apparently excellent fluorescent lighting installation. His complaint was "I am fed up. I haven't seen daylight for over a week." Mr. Owen quotes a remark by Dr. Wellwood Ferguson to the effect that the human eye is familiar with **wide variations in daylight conditions** and finds perfectly diffused and unvarying artificial lighting monotonous. It does seem that we have something yet to learn—even in applying such an excellent source as the fluorescent lamp.

Mr. Owen also finds general agreement that **people see better in the blackout without their glasses.** On this point also he consulted Dr. Wellwood Ferguson, who seems to agree with the view of Mr. Hime, quoted in our last number, that the absorption of part of the very weak available light by the lenses of the glasses is a material factor.

Several questions put to me in regard to the **photometry of fluorescent tubular lamps** lead me to refer to a useful contribution on this subject by G. R. Baumgartner ("Illuminating Engineering," December, 1941, p. 1,340). It is now pretty widely known that one cannot calculate the illumination at close quarters in terms of the inverse square law. (Quite close to the tube the illumination diminishes inversely as the distance, instead of the square of it.) Candlepower readings, applicable to distant illumination, should be taken at a distance of at least five times the length of the lamp (i.e., at not less than 25 ft. for the standard 5 ft. lamp).

Another point brought out by the author is that 10 to 15 mins. should be allowed for the lamp to become stabilised after being switched on. The confinement of lamps in reflectors and the mounting of lamps closely adjacent to each other affects the temperature and hence also the candlepower in some degree.

The mention of **atmospheric absorption** given in Mr. Lay's recent I.E.S. paper (July, 1942, p. 88) has aroused some interest. I have been asked whether the diminution in illumination in a factory owing to this cause can possibly reach 20 per cent. As it happens this point is dealt with in the account of the discussion of the paper in this issue (pp. 100-102). It may be inferred that rather exceptional conditions, i.e., a great mounting height and an unusually dusty or smoky atmosphere, are necessary to lead to an absorption as high as 20 per cent.; but 5 per cent. would not be at all unusual.

It is obviously in cases where the "carry" of the beam of light is great that atmospheric absorption becomes of moment, even when the atmosphere is not very noticeably misty—for example, in **street lighting** and in such problems as the **lighting of aerodromes and railway yards,** and in photometric experiments where the testing distance is relatively great. The scattering effect of fine dust may lead to considerable absorption. I have a recollection of some tests of arc lamps made many years ago in a large gallery, used intermittently for dancing classes. The peculiar photometric results on certain nights revealed unmistakably that the dancers had been "kicking up a dust."

Consideration of the wide variations in the actual illumination in a street during more or less misty winter nights shows the futility of attempting to enforce a rigid contract, with penalties for failing to maintain a stated illumination—or even for failure to furnish a certain candlepower measured on the spot.

Particulars of the **Examinations in Illuminating Engineering,** conducted by the City and Guilds of London Institute, may be obtained from their Department of Technology (31, Brechin-place, South Kensington, S.W.7). The next examinations will take place on May 10 and 11, 1943, and entries should be received by the City and Guilds by March 15. I understand that the I.E.S. intends to issue, very shortly, a leaflet relating to this examination and containing specimens of questions set in previous years.